



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of : CHO, Toshitsura et al.

Application No. : 10/779,680

Filed : February 18, 2004

For : Abrasive Slurry Having High Dispersion Stability and  
Manufacturing Method for a Substrate

Group Art Unit : 1755

DECLARATION UNDER 37 CFR 1.132

Honorable Commissioner for Patents

Alexandria, VA. 22313-1450

Sir:

Now comes Toshiaki ASO who declares and says that:

1. I am an inventor of United States Patent Application Number 10/779,680.
2. I graduated from Ooita Prefectural Tsurusaki Industrial High School in February 1985.
3. I have been employed by Tama Chemicals Co., Ltd. since March 1985, and studied improvements of ready-made product for request of customer and a new product development.
4. I made the following supplemental experiments for the purpose of confirming a work of the limitation "the weight distribution ratio ( $C_c/C_p$ ) of the particle concentration ( $C_c$ ) of the colloidal fine particles to the particle concentration ( $C_p$ ) of the abrasive fine particles is 1 or less" of claim 1 of the present invention. And I confirmed a difference on the basis of the above-mentioned limitation between the present invention and Tanaka reference (US 6,312,487).

## EXPERIMENTS

### [Preparation of Abrasive Slurry]

The same cerium oxide particles (trade name: TE-508, produced by SEIMI CHEMICAL Co., Ltd.) as used in Examples of the present invention (US Patent Application Number 10/779,680) were used as abrasive fine particles, and the three types of colloidal silica {① Colloidal silica (20 nm) having a silica content of 20 wt% and an average particle size of 20 nm, ② Colloidal silica (70 nm) having a silica content of 30 wt% and an average particle size of 70 nm and ③ Colloidal silica (170 nm) having a silica content of 22 wt% and an average particle size of 170 nm} prepared by the same manner as shown in Examples of the present invention were used as colloidal fine particles. The pure water was also used as a dispersion medium in the same way as Examples of the present invention.

Those were mixed at a blending ratio shown in Table 1 and uniformly mixed by a stirrer in the same way as Examples of the present invention, preparing abrasive slurry according to each of Examples 1 to 9 and Comparative Examples 1 to 6.

### [Evaluation of Preparation/Aggregation Condition and Redispersal Property and Measurement of Quartz Substrate Polishing Rate]

To the abrasive slurry according to each of Examples 1 to 9 and Comparative Examples 1 to 6, the preparation/aggregation condition and redispersal property were evaluated by the same way as Examples of the present invention, and the quartz substrate polishing rate was also measured by the same way as Examples of the present invention.

The precipitation/aggregation condition and the redispersal property were evaluated based on the following four criteria in the same way as Examples of the present invention.

◎: The whole precipitated portion was soft, which could be redispersed through shaking with hands for several seconds and redispersed through stirring with the

stirrer for 5 or less minutes.

○: The precipitated portion was partially solidified, which took about 30 seconds to redisperse through shaking with hands and about 10 minutes to redisperse through stirring with the stirrer.

△: The precipitated portion was partially solidified, which took 2 or more minutes to redisperse through shaking with hands and about 10 minutes to redisperse through stirring with the stirrer.

×: The whole precipitated portion was solidified throughout, which could not be redispersed even through shaking with hands for 10 minutes and which took 10 or more minutes to redisperse through stirring with the stirrer.

The results are shown in Table 1 and Table 2.

[Table 1]

Example No.		1	2	3
Composition of abrasive (wt%)	Cerium oxide particle( $\text{CeO}_2$ ) (Cp)	5	5	5
	Colloidal silica(20 nm) (Cc)	1	2.5	5
	Cc/Cp	0.2	0.5	1.0
Evaluation of precipitation/aggregation condition and redispersion property		◎	◎	◎
Quartz substrate polishing rate (three-fold diluent: $\mu\text{m}/10\text{ min}$ )		10	10	10
Example No.		4	5	6
Composition of abrasive (wt%)	Cerium oxide particle( $\text{CeO}_2$ ) (Cp)	5	5	5
	Colloidal silica (70 nm) (Cc)	1	2.5	5
	Cc/Cp	0.2	0.5	1.0
Evaluation of precipitation/aggregation condition and redispersion property		◎	◎	◎
Quartz substrate polishing rate (three-fold diluent: $\mu\text{m}/10\text{ min}$ )		10	10	10
Example No.		7	8	9
Composition of abrasive (wt%)	Cerium oxide particle( $\text{CeO}_2$ ) (Cp)	5	5	5
	Colloidal silica (170 nm) (Cc)	1	2.5	5
	Cc/Cp	0.2	0.5	1.0
Evaluation of precipitation/aggregation condition and redispersion property		◎	◎	◎
Quartz substrate polishing rate (three-fold diluent: $\mu\text{m}/10\text{ min}$ )		10	10	10

[Table 2]

Comparative Example No.		1	2
Composition of abrasive (wt%)	Cerium oxide particle( $\text{CeO}_2$ ) (Cp)	5	5
	Colloidal silica (20 nm) (Cc)	10	15
	Cc/Cp	2.0	3.0
Evaluation of precipitation/aggregation condition and redispersion property		×	×
Quartz substrate polishing rate (three-fold diluent: $\mu\text{m}/10\text{ min}$ )		7	5
Comparative Example No.		3	4
Composition of abrasive (wt%)	Cerium oxide particle( $\text{CeO}_2$ ) (Cp)	5	5
	Colloidal silica (70 nm) (Cc)	10	15
	Cc/Cp	2.0	3.0
Evaluation of precipitation/aggregation condition and redispersion property		×	×
Quartz substrate polishing rate (three-fold diluent: $\mu\text{m}/10\text{ min}$ )		7	5
Comparative Example No.		5	6
Composition of abrasive (wt%)	Cerium oxide particle( $\text{CeO}_2$ ) (Cp)	5	5
	Colloidal silica (170 nm) (Cc)	10	15
	Cc/Cp	2.0	3.0
Evaluation of precipitation/aggregation condition and redispersion property		×	×
Quartz substrate polishing rate (three-fold diluent: $\mu\text{m}/10\text{ min}$ )		7	5

## CONCLUSIONS

As apparent from the result shown in the above-mentioned Table 1, the abrasive slurry (having 0.2, 0.5 or 1.0 of Cc/Cp) according to each of Examples 1 to 9 of the present invention exerted excellent properties in terms of the evaluation on the preparation/aggregation condition and the redispersion property and the quartz substrate polishing rate.

As opposed to the abrasive slurry of the above-mentioned Examples 1 to 9 of the present invention, as apparent from the result shown in the above-mentioned Table 2, the abrasive slurry (having 2.0 or 3.0 of Cc/Cp) according to each of Comparative Examples 1 to 6 were clearly inferior in the evaluation on the preparation/aggregation condition and remarkably slower in the quartz substrate

polishing rate than the abrasive slurry the present invention.

On the other hand, the Tanaka reference only discloses abrasive slurry having 1.7 or more of a weight distribution ratio of the particle concentration (Cc) of SiO<sub>2</sub> to the particle concentration (Cp) of the abrasive fine particles (ZrO<sub>2</sub>, CeO<sub>2</sub>, and Al<sub>2</sub>O<sub>3</sub>) as described in Experiment Nos. 17 & 18 of Table 1-2.

Consequently, the Tanaka reference does not disclose the limitation "the weight distribution ratio (Cc/Cp) of the particle concentration (Cc) of the colloidal fine particles to the particle concentration (Cp) of the abrasive fine particles is 1 or less" of claim 1 of the present invention.

I, the undersigned petitioner, further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

This 15<sup>th</sup> day of September 2005

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